SYSTRON DONNER

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ADDENDUM

MODEL VPH5.2-50 MOVS6539

The Model VPH5.2-50 MOVS6539 Power Supply is similar to the standard Model VPH5-60 MOV as described in the enclosed manual with Special Modification S6539 added.

Special Modification S6539 consist of:

Providing input voltages of 208, 220, 230, and 235 ±10% at 50/60 Hz.

Provide output of 5.2 volts 50 amps.

Change T101 new part number 504291.

Change F101 to 7A 250V new part number 870194.

Add terminal strip for voltage taps with markings, new part number 850064.

Change Q104 thru Q113 to 2N6258 new part number 700088A.

Overvoltage set to 6.2V ±0.2V.

Overload protection set for 57.5A ±1A.

Refer to Schematic #E124150.

INSTRUCTION MANUAL

This manual describes the VPH ValuPower Half Rack Series Power Supplies. It contains information of the following:

Model VPH5-60M OV
Model VPH12-35M OV
Model VPH15-31M OV

Model VPH24-22M OV
Model VPH 28-19M OV

Model VPHD15-13M OV

VPH SERIES
VALUPOWER HALF RACK POWER SUPPLIES

MODEL NO.

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SYSTRON DONNER

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TEST & MEASUREMENT GROUP OF SYSTRON DONNER WARRANTY POLICY

I Warranty

The Test & Measurement Group of Systron Donner warrants that at the time of shipment the products manufactured by Systron Donner's T & M Group and sold hereunder will be free from defects in material and workmanship and will conform to the specifications furnished by or approved in writing by Systron Donner's T & M Group.

II Warranty

A The warranty period for products published in our latest product catalog will be one year from the date of shipment. This warranty is extended only to the original buyer.

B The warranty period for products published in prior catalog, will be 90 days from the date of shipment.

C The warranty period for modified standard products, custom products, or new spare part assemblies will be 90 days from the date of shipment.

D The warranty period for systems or assemblies of miscellaneous components and products will be limited to the warranty for the stand alone component or instrument. The system itself is not guaranteed unless a specific installation and service agreement has been negotiated between Systron Donner and the customer. In this latter case, the warranty period will be 30 days after the installation of the system while the various portions of the system will be limited to the normal component or instrument stand alone warranty, and for non Systron Donner material within the system that is furnished by Systron Donner the warranty will be limited to the supplier's normal warranty.

III Warranty Adjustments

A If any defect within this warranty appears, Purchaser shall notify Seller immediately.

B Systron Donner's T & M Group agrees to repair or furnish a replacement for, but not install, any product which, within the standard warranty shall, upon test and examination by Systron Donner's T & M Group, prove defective within the above warranty period.

C No product will be accepted for return or replacement without the written authorization of Systron Donner's T & M Group. Upon such authorization and in accordance with instructions by Systron Donner's T & M Group, the product will be returned to the original manufacturing location, shipping charges prepaid by Purchaser.

IV Exclusions from Warranty

A The foregoing warranty is in lieu of and excludes all other expressed or implied warranties of merchantability or fitness or otherwise.

B Systron Donner's T & M Group will not be liable for any special or consequential damages or for loss, damages or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with any other equipment or material, or from any other cause.

C The warranty does not extend to any product manufactured by Systron Donner's T & M Group which has been subjected to misuse, neglect, accident, improper installation or to use in violation of instructions furnished by Systron Donner's T & M Group.

D The warranty does not extend to or apply to any unit which has been repaired or altered at any place other than at a Systron Donner T & M Group factory, by persons not expressly approved by Systron Donner's T & M Group, not to any unit, the serial number of which has been removed or defaced or changed.

E This warranty applies to new equipment only and will cover repaired or replacement items only to the extent of the balance remaining of the items original warranty period noted above in Paragraph II.

F All freight charges will be paid for by the Purchaser.

Divisions in the Test & Measurement Group include:
Instrument Division – Concord, CA
ACD Division – Sunnyvale, CA
SD GmbH – Munich, West Germany

January 1982

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SECTION I
DESCRIPTION

1.1 INTRODUCTION

The ValuPower Half Rack (VPH) Series Power Supplies are flexible and dependable sources of DC power, which can be used to meet a variety of needs. These needs may range in scope from inspection and production testing, to laboratory bench testing, IC and system applications.

The voltage adjustment range makes these units well suited for specific systems applications. The ability to provide power packaged in minimum space with high reliability and performance meets the demands of most systems requirements.

This instruction manual provides general characteristics and specifications, operating procedures, theory of operation, calibration and maintenance, parts lists and related schematics for the ValuPower Half Rack series Power Supplies Models, VPH5-60M OV, VPH12-35M OV, VPH15-31M OV, VPH24-22M OV, VPH28-19M OV and VPHD15-13M OV.

1.2 DESCRIPTION

The VPH Series is a unique innovation in DC power supply technology. It provides high power output with excellent regulation, low ripple, fast response and low output impedance for powering and protecting sensitive IC's and systems.

The VPH Series units are available in five slot range outputs and one dual output model (VPHD15-13M OV) providing ±11.5 to 15.5 Vdc at 13 amps. All units are half rack, 5-1/4" high for bench or rack mounting with suitable adapters.

This series is multi-versatile for use in either multiple output power systems or in lab applications with optional meters and controls.

For multiple output power applications, the VPH Series is compatible with Trygon's RM521 and RAH-2B rack adapters. These rack confiugrations afford the user the opportunity to mix and match smaller units with different ratings providing a complete system power supply with multiple outputs for various power requirements.

1.3 GENERAL FEATURES

This series features UL Design, low noise for IC and Systems applications, extremely low output impedance, unique self-test output indicator lamp, adjustable current limiting, remote sensing and programming, overvoltage protection, no turn on/turn off transients, positive convection cooling and versatile rack and bench mounting capability for multiple output power. Output, sensing and remote programming terminals are located on the rear panel of the unit. The AC power switch, DC "ON" lamp, voltage control, and appropriate optional metering devices are all located on the front panel.

1.3.1 Constant Voltage Model

A constant voltage is maintained across the output terminals at any preset value within the rated slot voltage range, provided that the load does not draw more than either the rated output current or more than the preset limiting current value determined by the top recessed current control setting.

1.3.2 Automatic Foldback Current Limiting

Short circuit protection is provided by the automatic current limiting circuit which limits the maximum output current under all load conditions. The point at which automatic current limiting occurs is variable and may be selected anywhere between 40% of the rated output current and maximum rated output current of the unit. In the event of an overload, the current and voltage foldback into a safe operating region. In the event of a short circuit, the output current is limited to approximately 40% of the rated current.

1.3.3 Remote Programming

Remote Programming is provided in the voltage mode of operation and may be utilized over the entire voltage range of the unit. The scale factor for remote voltage programming is approximately 500 ohms per volt.

1.3.4 Adjustable Overvoltage Protection

Adjustable overvoltage protection (OV) has a special circuitry which prevents the output from exceeding a preset voltage. An external adjustment control recessed in the top cover is provided to vary the point at which the OV circuit will activate. The overvoltage crowbar will latch when an overvoltage condition occurs and must be reset by cycling the AC input power off and on again. The OV protection point should not be set lower than 1 volt above the minimum power supply voltage rating or 5.5 V minimum.

1.4 PRECAUTIONARY MEASURES

1.4.1 Wire Size

To assure proper regulation under all load conditions and to prevent severe distortions of the AC line voltage, it is very important to take into consideration the physical size and current handling capabilities of the input power line. Serious losses in regulation and an increase in ripple may result from underrated or overloaded AC input lines. The maximum AC impedance from the breaker box to the power supply should not exceed 0.5 ohms.

1.4.2 Terminal Post Resistance

All terminals and shorting links serving outputs, sensing and programming must be securely tightened before use. Serious loss of regulation and an increase in ripple can result due to a voltage drop caused by loose terminals and shorting links.

The specifications cited herein for regulation and ripple can be readily attained on every power supply providing the proper method of measurement is employed. The major consideration is that the highly stable meter and oscilloscope, specified in the calibration procedures, must be connected to the sensing terminals and not the load terminals. The reason for this precaution is that the voltage drop between the load terminals and sensing terminals will yeild an inaccurate regulation ripple measurement.

1.5 SPECIFICATIONS

Table 1-1 is a complete list of standard specifications for the ValuPower Half Rack Power Supplies.

TABLE 1-1 SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

Input:	105-132 Vac[1], 57-65 Hz. (200-250 Vac, 47-65 Hz option available)[2].
Output:	Floating; Isolated from ground, 300 Vdc maximum. Internal protection is provided for applied reverse voltage.
Regulation Line:	0.02% for 105-132 Vac line change.
Regulation Load:	0.02% or 5 mV* for no load to full load.
Ripple:	Less than 1 mV RMS; total ripple and noise less than 5 mV p-p +0.05%(to 10 MHz).
Stability:	0.05% +10 mV, for 8 hours after 30 minutes warm-up. Measured at constant line, load and ambient temperature.
Temperature Coefficient (Per°C):	0.02%/°C.
Temperature Range:	-20°C to +71°C.
Temperature Storage:	-55°C to +85°C.
Recovery Time:	50 microseconds to within 30 mV for a Δ1 change as shown in the table.
High Stability (X Option):	0.03%/8 hours. 0.1%/1000 hours. TC 0.01%/°C.
Overload Protection:	A unique patented automatic non-linear current foldback system is incorporated in these units. It is adjustable from 40% to 100% of rated load and affords maximum protection of the series pass regulator while providing maximum reliability should an overload condition occur. (A minimum short circuit current of 10% will be delivered into any class of load, ensuring proper operation with most non-linear loads).

TABLE 1-1 SPECIFICATIONS (Cont'd)

ELECTRICAL SPECIFICATIONS (Cont'd)	
AC Power Input Protection:	Rear panel mounted fuse.
Remote Programming:	Programmable over rated voltage range. Scale factor approximately 500 ohms/volt.
Remote Sensing:	Maintains rated regulation directly at the load. Maximum line drop 0.5 V per leg is included in voltage range. Internal protection is supplied for open sensing leads.
Voltage Adjustment Range:	Continuously adjustable over rated voltage range. Resolution and settability 0.1%.
UL Approval:	Designed to meet UL Recognized Component Index requirement.
GENERAL & PHYSICAL SPECIFICATIONS	
Design Principle:	Prescision Series Pass Regulation.
Operational Modes:	Constant Voltage with Automatic Current Foldback Protection.
Controls:	
Voltage:	Continuous voltage adjustment, front panel screwdriver locking adjust.
Current:	Top recessed adjustment, 40% to 100%.
Input Power:	Front panel AC ON switch (optional)[3].
Output Power:	Front panel DC output indicator.
OV Adjust:	Top recessed adjustment potentiometer.
Metering (Option)[3]:	
Voltage:	Front panel Voltmeter (meter accuracy ±2%).
Current:	Front panel ammeter (meter accuracy ±2%).
Rear Panel Power Output Terminals:	(TB-3) 1/4-20 heavy duty terminals for +V and -V.
Rear Panel Barrier Strip:	(TB-1) (1) AC; (2) Ground G; (3) AC. (TB (TB-4) (1) Negative Output -V; (2) Negative Sensing -S; (3) Remote Voltage Programming RVP: (4) Positive Sensing +S; (5) Positive Output +V.
Systems Rack Mounting Capability:	VPH units without meters can be mounted in Rack Models RPS-8B, RAH-2B or RQH-3B racks for multiple output power are used where meter option is requested. Rack Model RM521 is used for multiple output systems applications where meters and controls are required, external to the unit.

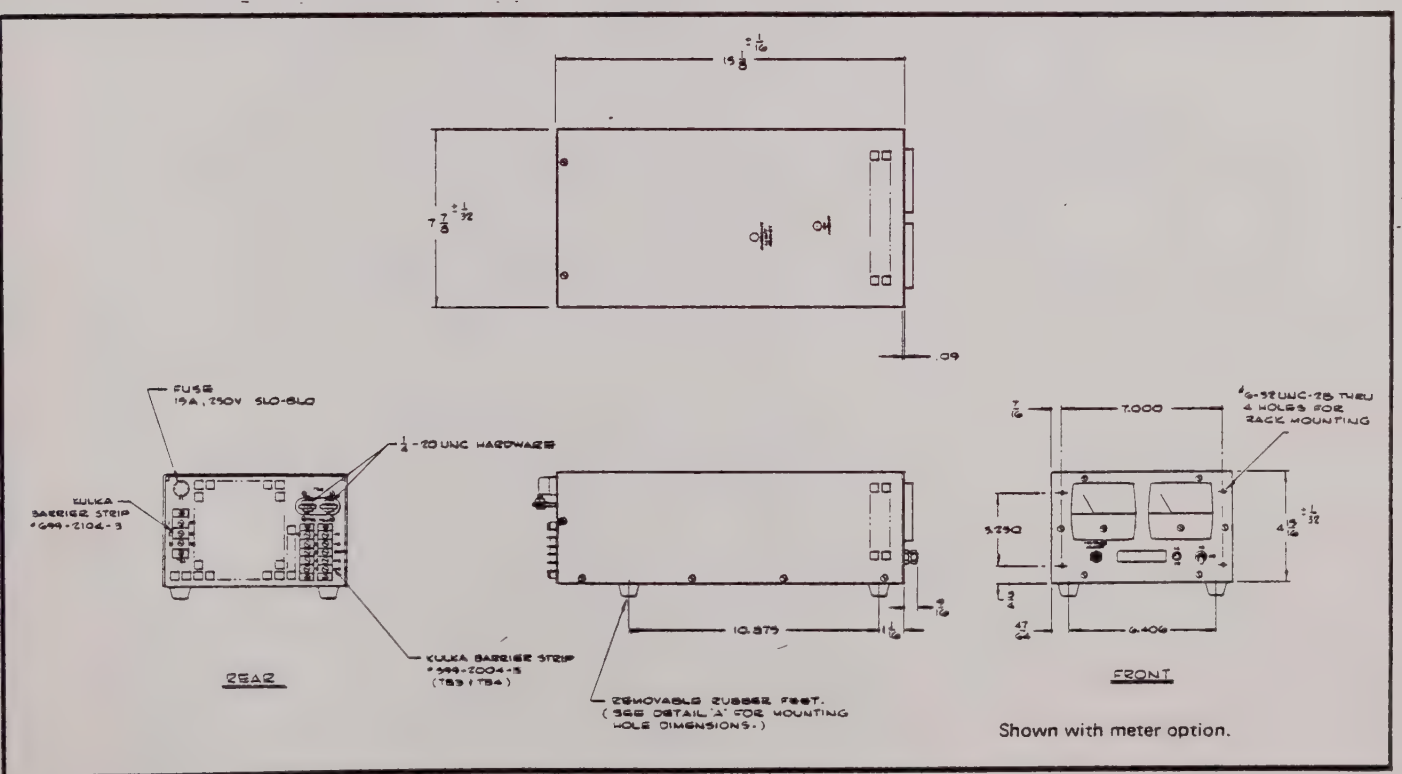
TABLE 1-1 SPECIFICATIONS (Cont'd)

GENERAL & PHYSICAL SPECIFICATIONS (Cont'd)

Overvoltage Protection:	Automatic fast acting, adjustable over-voltage protection available with recessed adjustment.
Dimensions:	5-1/4" x 7-3/4" x 16-1/4".
Weight:	40 lbs.

NOTES: [1]Derate output current 15% for operation above 125 Vac (or 238 Vac).
[2]Derate current 10% or temperature 10 C. Multiply ripply by 2x factor.
[3]When meter option (suffix M) is ordered, unit is provided with four rubber mounting feet for bench use, AC switch and DC output indicator as well as voltage and current meters.

Model	Volts	Max. Amps at Ambient of: 40°C	60°C	71°C	Nominal AC Line Current Rms Amps	Nominal Impedance DC-1 KHz Ohms	Recovery ΔI Amps	Eff* (%)
VPH 5-60 OV**	4.75 to 5.5	60	45	35	8	0.0005	15	40
VPH 12-35	11.0 to 13.0	35	24	20	9	0.001	12	50
VPH 15-31	14.0 to 16.0	31	21	18	9	0.001	10	55
VPH 24-22	23.0 to 26.0	22	15	13	10	0.001	8	57
VPH 28-19	26.0 to 30.0	19	13	11	10	0.001	6	57
VPHD15-13 (Dual)	±11.5 to 15.5	13	9	7.5	7.5	0.001	4	51



Shown with meter option.

SECTION 2

INSTALLATION AND OPERATION

2.1 MECHANICAL INSTALLATION

When the ValuPower Half Rack series power supply is to be used in a rack configuration, rack adapter RAH-2B may be used for either metered or unmetered models. The RAH-2B will accommodate two VPH units side by side. Rack model RM521 can accommodate VPH units intermixed with other modules as well.

For rack mounting, the four rubber feet are removed before placing unit into the rack adapter. The rubber feet provided on all units allow the power supply to be used as a bench supply.

2.2 ELECTRICAL CONNECTIONS

Input Power

A three-terminal barrier strip mounted on the rear panel provides AC input connections to the unit.

The power handling ability of the AC power lines feeding AC power to the unit must be considered, as serious losses in regulation and substantial increase in ripple may occur as a result of insufficient power capacity of these lines. All AC power line connections must be securely tightened and any movable electric contact surface (such as the wiper arm of a variable transformer) should be kept clear of impedance producing oxide coatings.

Care should be exercised in selecting the proper wire size for the AC input lines. The AC wire size should be sufficient so that the line drop does not exceed a value which will allow the input voltage to drop below the specified lower limit of 105 VAC.

An AWG #16 should be adequate for most short runs of 20 ft. or less. Increase wire size to #14 for up to 50 feet and to #12 for up to 100 feet.

Output, Rear Panel

On single output VPH units, main output is provided on two heavy duty terminals. A second auxilliary terminal block is provided for remote sensing and remote programming.

On dual output VPHD units, the negative output, negative remote sensing and remote programming is provided on one terminal block, with positive output, positive remote sensing, and common voltage return and common remote sensing provided on a second terminal block.

2.3 OPERATING CONFIGURATIONS

The ValuPower series power supplies are designed to operate as highly regulated constant voltage sources with automatic foldback current limiting. There are various operating configurations that can be used by proper application of shorting links

2.3 Continued

and wiring. The following paragraphs describe the various operating configurations and their connections.

Local Voltage Programming (Fig. 2-1)

To adjust the output voltage from the power supply, connect a shorting link across terminals 2 and 3. With this shorting link installed, the voltage adjust control provides adjustment of the output over the rated slot voltage range.

Remote Voltage Programming (Fig. 2-2)

Remote voltage programming is achieved by removing the shorting link from terminals 2 and 3 and substituting a resistive element of proper value across terminals 2 and 3 external to the power supply.

Sensing Connections

Local Sensing (Fig. 2-1)

Local sensing connections are made when rated regulation is not required directly at a remote load.

Connect the load to output studs +V and -V, and ascertain that shorting links are connected between terminals 1 and 2 and 4 and 5.

Remote Sensing (Fig. 2-3)

Remote sensing is used when rated regulation is required at a remote load.

Remove the shorting links between terminals 1 and 2 and 4 and 5. Using a twisted, shielded pair of wires, connect the -S (2) and +S (4) sensing terminals to the load. To prevent damage to the power supply, correct polarity of both the remote sensing and output leads must be observed. The negative remote sensing lead (-S) and negative output lead (-V) must be connected to one side of the load and the positive remote sensing lead (+S) and positive output lead (+V) connected to the other side of the load. The shield should be grounded at the power supply end of the cable.

2.4 CONTROLS

Front Panel

AC ON - switch controls power
Voltage Adjust - Potentiometer, Adjusts voltage output.

Top Cover (Recessed Controls)

Current Limit - Potentiometer adjust current limiting point
OV Adjust (option) potentiometer adjust overvoltage protection point in units having this optional feature.

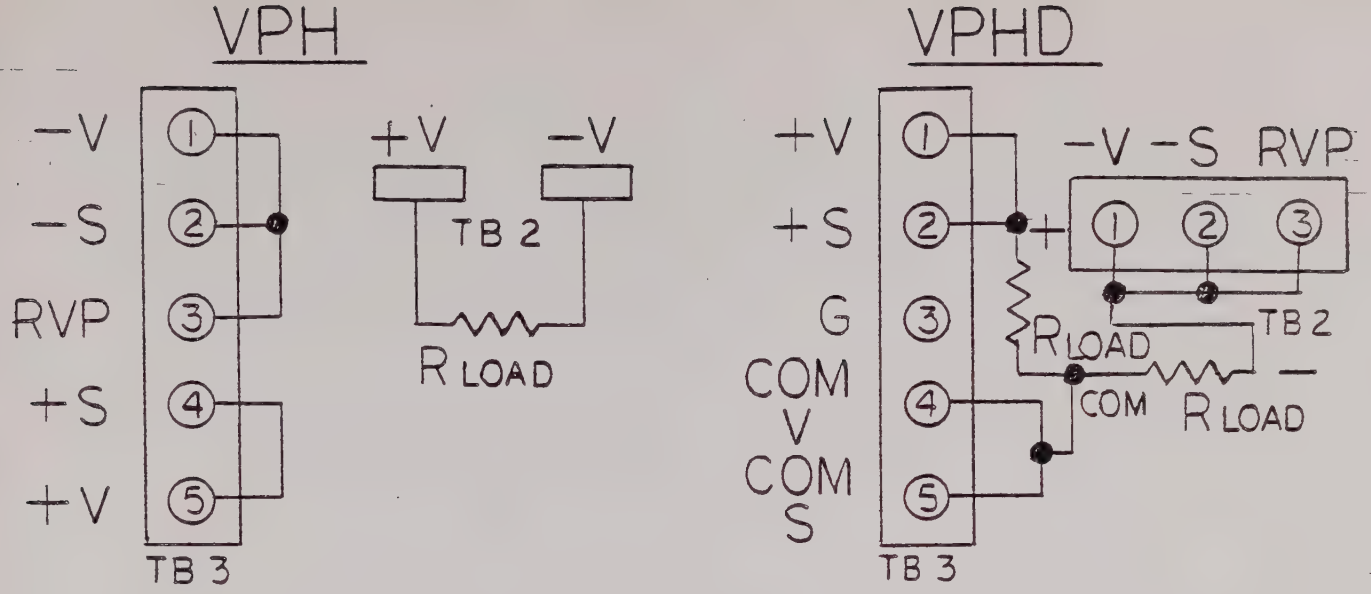


FIG 2-1 LOCAL PROGRAMMING, LOCAL SENSING

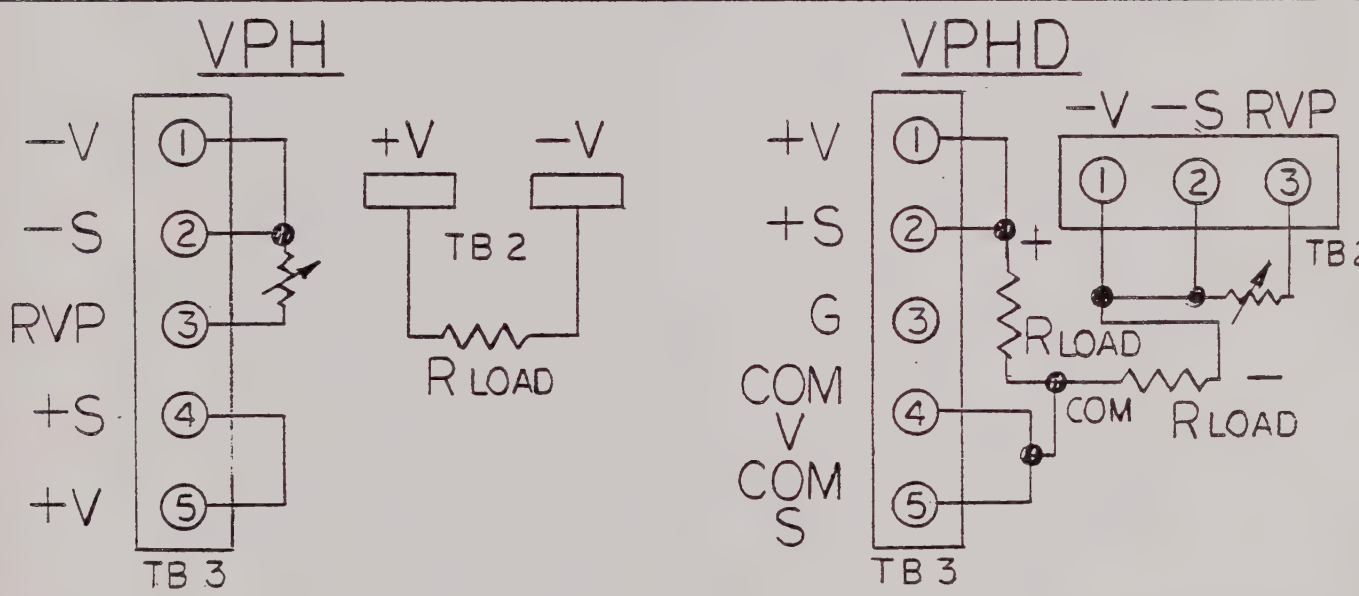
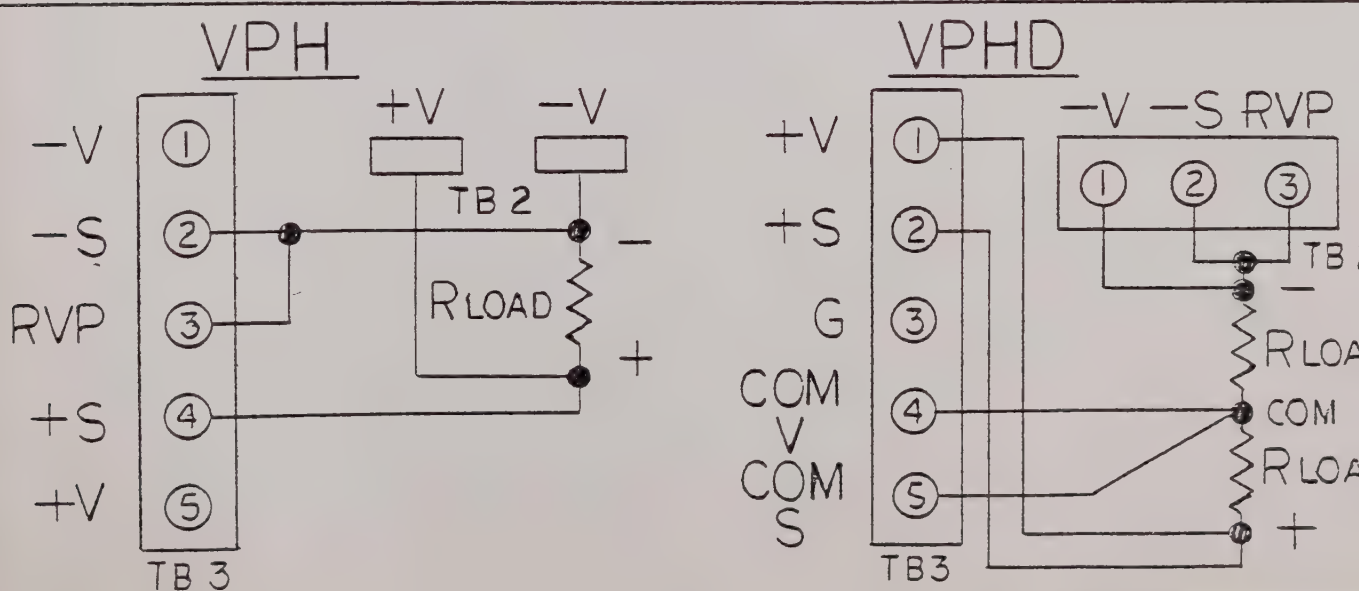


FIG 2-2 REMOTE VOLTAGE PROGRAMMING



Internal

All internal control settings have been factory preset and require no additional adjusting. However, if it should become necessary to adjust any of the internal controls due to circuit changes caused by component aging or replacement, refer to the calibration section of this manual.

2.5 OPERATION

Control Settings

Set front panel control full CCW, top recessed controls fully CW.

Shorting Links

Prior to the application of power, connect all loads, external wiring and shorting links required for the mode of operation desired.

Grounding

Either side of the output may be grounded, or the output may be used in a floating condition.

Power On

Connect the unit to a nominal AC input power source. Set AC power switch to ON, and observe that pilot lamp is lit.

Warm-Up

No warm-up time is necessary to place the unit into operation. However, a 30 minute warm-up period is recommended to reach rated stability. The unit is now ready for operation.

SECTION 3

THEORY OF OPERATION

3.1 GENERAL

The purpose of the ValuPower series power supplies is to transform and rectify the AC input into a well regulated, stable and adjustable DC output. The following paragraphs describe the major circuits used in the power supply. As each circuit is described, reference should be made to both the Block Diagram, Figure 3-1 and the Schematic Diagram in the rear of this manual.

Primary Input

Input power is obtained through power transformer T101, diodes and filter capacitors. When power switch S101 is set to ON, the output indicator lamp DS 101 glows and AC power is applied to T101 and cooling fan B101. Regulated DC output voltage is immediately available from the power supply.

Series Regulator

The rectified voltage from the diodes and filter capacitors is directed through the Series Pass transistors. The conduction of these transistors is controlled by circuitry which causes them to act as variable resistors. Their overall resistance varies in accordance with the need of the power supply to increase or decrease its output voltage or current. The Series Pass transistors are controlled by driver stages which amplify signals from the Error Amplifier.

Reference Supply, Comparator, Error Amplifier, and Current Limiting

A single integrated circuit, A1, combined the circuitry required to perform the task usually required by many discrete components.

The stable reference voltage is generated and indicated at the circuit reference V REF. When A1 gets the zener regulated voltage across its terminals 5 and P, a precision voltage reference is developed across its terminals 4 and 5. A fixed sample of this voltage is fed into terminal 2 which is one input of the error amplifier.

The voltage which A1 compares the reference voltage to, is fed into terminal 3. Any change in the output voltage is automatically compensated for as the error amplifier generates a correction drive signal at terminal 6 which changes the output voltage accordingly.

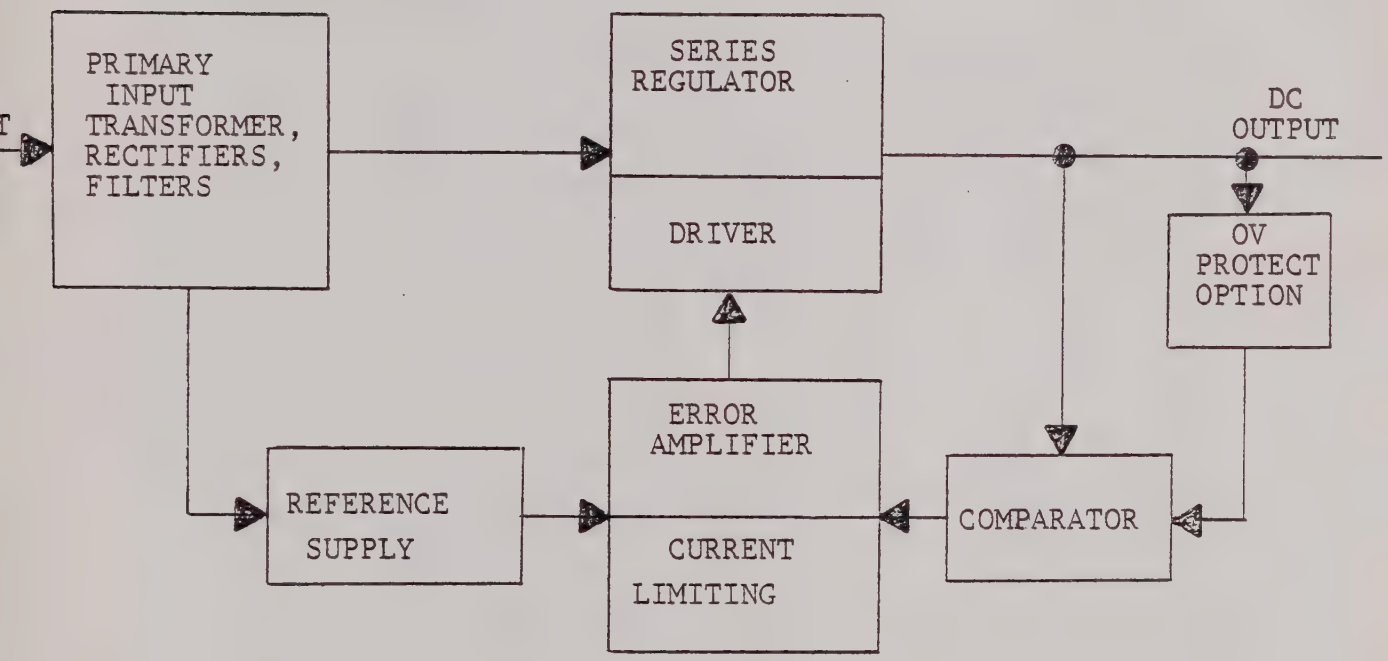
Current limiting is provided by input 10 which will control the error amplifier's output when an overcurrent condition is present.

Terminal A is a compensating input to A1, to insure stability and prevent oscillations under certain load conditions.

3.1 Continued

Overvoltage Circuit (Option)

A sample of the output voltage is developed across R21. This sample is brought to terminal 1 (anode) of the silicon unilateral switch (SUS), which has the characteristics of suddenly conducting when the applied voltage exceeds a minimum threshold. When the SUS conducts it applies a gate signal to the SCR, which crowbars the output to nominal zero.



BLOCK DIAGRAM

FIGURE 3-1

NOTE: The dual output unit uses the negative output as the Master voltage with the positive output circuitry tracking automatically.

SECTION 4

CALIBRATION AND MAINTENANCE

4.1 GENERAL

The following adjustments should be made when necessary to assure optimum operating characteristics and maximum efficiency of the ValuPower series power supplies.

4.2 TEST EQUIPMENT REQUIRED (Or Equivalent)

1. Systron Donner Digital Multimeter Type 9025
2. External Current Shunt (150A rating)
3. Variable Auto transformer, 30 ampere rating

Shorting Link Application

For test purposes shorting links should be connected across rear panel barrier strip terminals 1 and 2, 2 and 3, 4 and 5, and 6 and 7 to provide local sensing and local voltage programming operation. To reduce pickup, shielded wire must be used for all connections between test equipment and the power supply being tested. To prevent ground loops, it is important that only one ground connection be made, as shown in Fig. 4-1. Tighten all terminals as securely as possible and set the front panel control. CW.

4.3 CALIBRATION PROCEDURE

Ammeter Calibration

1. Using a standard ammeter in series with an external load, adjust the load so the unit will operate at its maximum rated current (as indicated on the standard ammeter) and voltage output.
2. Adjust ammeter adjust control (VPH R24, VPHD R45) until ammeter M101 indicates the same current as the standard meter.

Current Limit Test

1. Establish nominal output voltage
2. Set current limit control VPH R11, VPHD R3 fully CW
3. Using an external load, apply a 20% current overload to the unit under test.
4. Adjust current limit control until the overload, as indicated on ammeter MI, is limited to between 5% and 10% (1.05 to 1.10 maximum rated current).

4.3 Continued

Constant Voltage Operation

Load Regulation Test

With the equipment connected as shown in Figure 4-1, connect a suitable load resistance across the output terminal connections. The load resistance selected must be able to dissipate the rated power of the unit (P=IE) and must be of sufficient value to yield the rated output current when the rated voltage is applied. Note the voltage indicated on the Digital Voltmeter. Disconnect the resistive load from the output.

The maximum change in output DC voltage should not exceed by more than .02% or 5mv (whichever is greater) that of the output voltage indicated with the load resistance applied across the output terminals.

Line Regulation Test

Place the resistive load across the output and note the voltage indicated on the DVM. Vary the AC input power 10% above and below the nominal AC input level. The maximum change in output voltage should not exceed by more than ±0.02% or mv (whichever is greater) that of the output voltage measured at either extreme of the AC input.

Ripple Voltage Test

In order to reduce pickup, shielded test leads should be used in making ripple measurements. With the resistive load connected across the output terminals, measure the AC ripple with the AC scale of the DVM. Vary the AC input power 10% above and below the nominal AC input level. The maximum ripple amplitude should not exceed 1mv RMS.

Overvoltage Sensitivity (option) (See Page 4-5 for Dual Unit)

The trigger point of the OV protection circuit is determined by the setting of the OV control R21, located through the top cover. To set the OV circuit to trigger within the output range of the power supply, set R21 CW. Turn on the supply and adjust it for the desired OV firing point. Turn R21 CCW until the output voltage drops as indicated by the voltmeter.

To set the OV circuit to fire at higher output voltage than the output voltage of the supply, a second current limiting type power supply is needed. With the supply under test, set its output voltage to any value. Turn R21 CW and connect the second supply across its output terminals. Set the second supply's output voltage to the desired OV firing point. Turn R21 CCW until the output of the supply drops to a low value as indicated on the voltmeter. This indicates that the OV circuit has fired at the voltage set on the second power supply.

4.4 MAINTENANCE

GENERAL

This power supply is a precision electronic instrument. It is strongly recommended that only experienced troubleshooting personnel perform troubleshooting operations or attempt to repair the unit. If the power supply appears to be malfunctioning at all, the following procedure is recommended for isolating possible defects.

Loads and Interconnections

1. Disconnect all loads and interconnections.

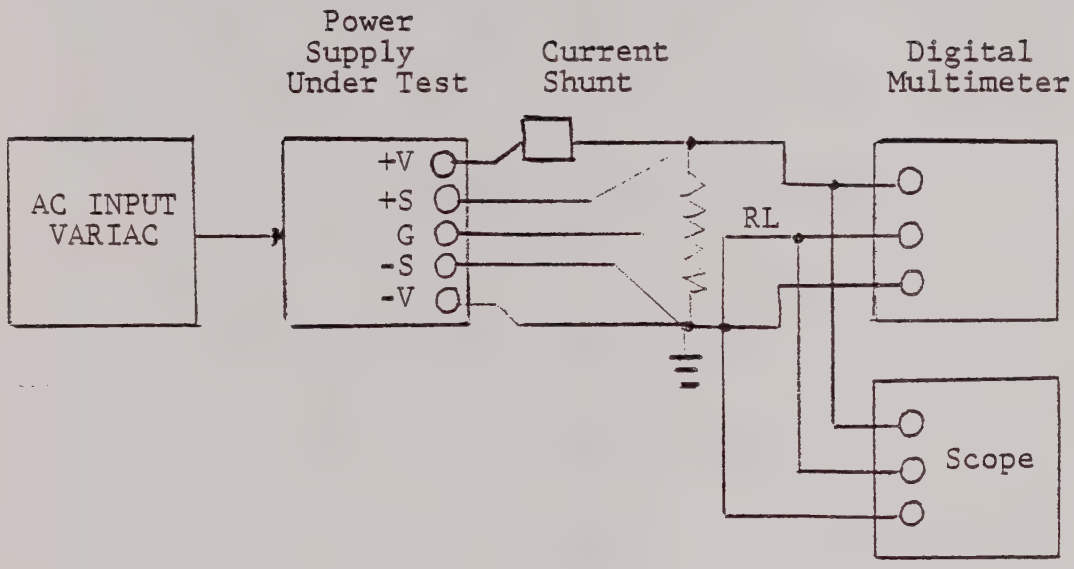
2. Connect a resistive load across the output terminals and operate the unit to determine whether the fault lies within the unit or externally. Observe that shorting links are in place across terminals to provide local sensing operation.

3. Set input voltage to nominal value (115 VAC) and operating controls for rated output. Satisfactory operation at this time would indicate that any malfunction previously encountered, is external in nature. All interconnections and loads normally used in conjunction with this power supply should then be carefully checked for electrical defects.

Troubleshooting

1. Set Voltage Adjust control fully CW. Use a high impedance digital voltmeter to check the voltages across the various circuit components, if shown on the Schematic Diagram located at the rear of this instruction manual. Any sample voltages listed apply only if the unit is operating at its nominal AC input, and has a dummy load of sufficient size connected across its output to allow operation at maximum rated current and voltage output levels. Any reading which is grossly incorrect, indicates that the stage being tested or the one immediately preceding it is defective. The Block Diagram, Schematic Diagram and appropriate sections of the Theory of Operation will prove helpful in any troubleshooting work. Proper polarity to be observed when testing can be easily obtained from the Schematic Diagram.

2. If voltage checks show no noticeable deviations from the prescribed values, disconnect AC power and proceed with point-to-point resistance checks across pots, switches, diodes, resistors, transistors, in that order.



CONSTANT VOLTAGE
OPERATION

TEST EQUIPMENT SET-UP

FIGURE 4-1

ADDENDUM FOR DUAL OUTPUT VPHD

VPHD OVERVOLTAGE PROTECTION

The overvoltage protection provided on the dual output VPHD is one whereby the total voltage of the plus and minus outputs is sensed. The overvoltage trip point is therefore approximately twice that of each individual supply. If either supply should go high in voltage it will cause the overvoltage crowbar to clamp both the plus and minus outputs to nominal zero volts.

The trigger point of the OV protection circuit is determined by the setting of the OV control R21, located through the top cover.

To set the OV circuit to trigger within the output voltage sum of the plus and minus voltages, set R21 CW. Turn on the supply and adjust the negative output voltage (the negative output is the master voltage with the positive output circuitry tracking automatically) for the desired OV firing point. Turn R21 CCW until the output voltage drops as indicated by the voltmeter.

To set the OV circuit to fire at a higher output voltage than the output voltages of the supply will adjust to, a second current limiting type power supply is needed.

Set the supply under test to its desired voltage with R21 turned CW. Connect the second supply across the plus and minus terminals of the supply under test and set its output voltage to the desired OV trip point. Turn R21 slowly CCW until the OV triggers as indicated by the drop in output voltage. This indicates that the OV circuit has fired at the voltage set on the second power supply.

* - DEVIATION FROM STANDARD VPH5-60 MOV

ITEM NO.	SIZE	PART NUMBER	DESCRIPTION	REFERENCE NO.	ASSY QTY	ACT. CODE	ISS. QTY	SHT QTY
1		065114	SHIPPING ASS'Y		X	X		
3			SCHEMATIC	D124150	R	R		
5	B	PD27841 /	ASS'Y TOP COVER & LABEL		1	2		
6	C	065613	COVER, FINISHED		1	2		
7			NAMEPLATE	069003	1	R		
8		840405	PLUG BUTTON		2	R		
9		065148	AC COVER		1	2		
12	B	PD27347	CHASSIS ASS'Y #1		1	2		
13	C	065608	CHASSIS		1	2		
14		840192	RUBBER FEET		4	1		
15		820371	CAP. 25,000μf-25V	C105, 106	3	1		
16			S/A C105	C108		R		
17		820274	6000μf-40V	C107	1	1		
20		106664	FAN	B101	1	1		
21		106879	CAP. CLAMP		1	1		
22		100725	" "		1	1		
23		065612	" "		1	2		
24		T9101110	GROMMET		1	R		
25	C	065609	BRKT, MTG-XFMR & CHOKE		1	2		
26								
27								
28		T9710210	1/4-20 x 1 1/4 HEX BOLT		2	1		
29	C	119112	FAN PLATE RIGHT		1	2		
30	C	119122	" " LEFT		1	2		
31		T9100110	GROMMET, 3/16		1	R		
32		065614	BAFFLE		1	2		
33		101022	INSULATION-TAPE		A/R	R		

MODEL	JOB NO.	LOT QTY	LOT NO.	CODE IDENT NO. 52542
PLANNER	PREP DATE	CHK'D	APP'D	SYSTRON DONNER CORPORATION
MAT. DUE				SHIPPING ASS'Y VPH 5.2-50 MOV S6539
B/U REQ.				DRAWING NO.
B/U COMP				SIZE P 065114 REV
				SHEET 1 OF 7

REVISION RECORD
SYM DESCRIPTION

ITEM NO.	SIZE	PART NUMBER	DESCRIPTION	REFERENCE NO.	ASSY QTY	ACT. CODE	ISS. QTY	SHT QTY
38	B	PD2501002	CHASSIS ASS'Y #2		1	2		
39		800304	CAP. 1μf-250V	C103	2	1		
40			S/A C103	C104		R		
41		504291	TRANSFORMER	T101	1	2		
42		710454	DIODE IN5401	CR101, 102	2	1		
43		504125	CHOKE	L101	1	2		
44								
45	B	118222	BUSS BAR POS. OUTPUT		1	2		
46	C	118232	" " NEG. OUTPUT		1	2		
47	B	122852	STRIP, OUTPUT HOLDING		1	2		
48	B	118292	SHUNT	R117	1	2		
49		800185	CAP. .1μf-250V	C101, 102	2	1		
50								
51		100827	6-32 x 5/16 HEX SPACER		2	1		
52		T990450	P.C. SUPPORT		2	1		
56	A	PD27346	REAR PANEL ASS'Y		1	2		
57		069051	" " FAB		1	2		
58		117377	FUSEHOLDER		1	1		
59		870197	FUSE 8A-250V	F1, F2	2	1		
60		850150	BARRIER STRIP	TB1	1	1		
61	B	118242	INSULATOR BLOCK	TB2	1	2		
62		850052	BARRIER STRIP	TB3	1	1		
63		840217	" " LINKS		3	1		
64		100827	HEX SPACERS 5/16 Lg		2	1		
65								
66		069116	AC DIAL PLATE		1	2		

REVISION DESCRIPTION

MODEL	JOB NO.	LOT QTY	LOT NO.	CODE IDENT 52542
PLANNER	PREP DATE		SYSTRON DONNER CORPORATION	
	CHK'D		SHIPPING ASS'Y VPH 5.2-50 MOVS 6539	
MAT. DUE	APP'D			
B/U REQ.			DRAWING NO.	
B.U. COMP			SIZE P	PART NO. 065114
			SHEET	

ITEM NO.	SIZE	PART NUMBER	DESCRIPTION	REFERENCE NO.	ASSY QTY	ACT. CODE	ISS. QTY	SHT QTY
			REAR PANEL ASS'Y (CONT)		X	X		
68		069115	AC INPUT FOILCAL		1	1		
69		780692	FUSE LABEL 8 AMP		1	1		
70	A	PD2500901	FRONT PANEL ASS'Y		1	2		
71	C	118284	" " FINISH		1	2		
72	A	06516701	METER ASS'Y 100A	M101	1	2		
73		065160	METER MVMT 1mA 77Ω		1	1		
74		117397	DIAL, BLANK	B065167	1	1		
75	B	06516902	METER ASS'Y	M102	1	2		
76	B	065160	METER MVMT 1mA 77Ω		1	1		
77		117397	DIAL, BLANK	B065169	1	1		
78		065049	P.C. BOARD		1	2		
79		102181	POT. 1K	R401	1	1		
80		102278	RES. 7.50K	R402	1	1		
81		103862	HEX NUT		1	1		
82		116669	SWITCH	S101	1	1		
83		770090	LED	DS101	1	1		
84		600140	POT. V ADJ 500Ω-2W	R116	1	1		
85		840220	SHAFT-LOCK		1	1		
86		085420	OUTPUT LABEL	PD27772	1	R		
89	A	PD25173	HEAT-SINK ASS'Y #2		1	2		
90	C	118982	HEAT-SINK		1	2		
91		705071	TRANSISTOR, 2N3447	Q101, Q102	2	1		
92		700196	2N4912	Q103	1	1		
93		830101	TRANSISTOR SOCKET		2	1		
94		830103	" "		1	1		
95		640020	RES. .2Ω-3W-10%	R101, R102	2	1		
96		101467	1K-½W	R103	1	1		
97		101498	100Ω-½W	R114	1	1		
98		859019	TERMINAL STRIP		1	1		
99		103358	MICA WASHER		2	R		

REVISIONS DESCRIPTION

MODEL	JOB NO.	LOT QTY	LOT NO.	CODE IDENT 52542
PLANNER	PREP DATE		SYSTRON DONNER CORPORATION	
	CHK'D		SHIPPING ASS'Y VPH 5.2-50 MOVS 6539	
MAT. CUE	APP'D			
B/U REQ.			DRAWING NO.	
			REF SIZE PART NO. REV	
B/U COMP			— P 065114	
			SHEET 3 OF 7	

ITEM NO.	SIZE	PART NUMBER	DESCRIPTION	REFERENCE NO.	ASSY QTY	ACT. CODE	ISS. QTY	SHT QTY
			HEAT-SINK ASS'Y #2 (CONT)		X	X		
01		100551	MICA WASHER		1	R		
05	B	PD27345	HEAT-SINK O.V. ASS'Y		1	2		
06	D	T115802	HEAT-SINK FAB		1	2		
07	B	065444	BRKT PC SUPPORT		2	2		
08		640190	RES. 10Ω-2W	R115	1	1		
09		640011	.1Ω-5W	R104-113	10	1		
10								
11								
12		118602	BUSS BAR EMITTER		1	2		
13								
14		860270	6-32×¼ HEX SPACER		2	1		
15		T990415	NYLON PUSH-IN NUT		3	R		
16		T990405	" " " "		2	R		
17		T990450	BRKT, P.C. SUPPORT		2	1		
18		118992	HEAT-SINK (ADDITION)		1	2		
19		T960347	RIVET		4	R		
20		700088	TRANSISTOR, 2N6258	Q104-113	10	1		*
21								
22		720129	DIODE, 1N1199A/MR1120	CR107	1	1		
23		720132	DIODE, 1N1200A	CR108	1	1		
24		720330	70H10A	CR103, 104	2	1		
25		830101	TRANSISTOR SOCKET		10	1		
26		T990350	RING INSULATOR		1	R		
27		T990307	MICA WASHER		2	R		
28		116969	SOLDER LUG		1	R		
29		580003	THERMAL SWITCH	S102	1	1		
30		720008	DIODE, SCR, 35A-50V	CR106	1	1		
31		T990340	RING INSULATOR		3	R		
32		100551	MICA WASHER		2	R		

MODEL	JOB NO.	LOT QTY	LOT NO.	CAGE CODE 52542
PLANNER	PREP DATE	SYSTRON DONNER CORPORATION		
	CHK'D	SHIPPING ASS'Y VPH 5.2-50 MOVS 6539		
MAT. DUE	APP'D			
B/U REQ.		DRAWING NO.		
		SIZE B	PART NO. 065114	REV
B.U. COMP		SHEET 4 OF 7		

REVISIONS
REV | DESCRIPTION

ITEM NO.	SIZE	PART NUMBER	DESCRIPTION	REFERENCE NO.	ASSY QTY	ACT. CODE	ISS. QTY	SHT QTY
			HEAT-SINK Q.V. ASS'Y (CONT)		X	X		
134		T960640	LUG		1	R		
138	C	PD25006	CONTROL BOARD ASS'Y		1	2		
139	D	T112256	" " FAB		1	2		
140		102598	CAP. 100μf-50V	C1	1	1		
141		800090	.01μf-600V	C3,8	2	1		
142		800002	470pf-600V	C4	1	1		
143		810060	35μf-25V	C5,6	2	1		
144		100134	.05μf-200V	C7	1	1		
145		100178	.1μf-100V	C9	1	1		
146								
147		821006	68μf-15V	C11	1	1		
148		100063	10μf-25V	C12	1	1		
149		102582	200μf-25V	C13	1	1		
153		100413	DIODE, IN5395	CR1,2,6,7,	6	1		
154				12,13		R		
155		720410	IN4741A	CR3	1	1		
156		100387	IN753A	CR4	1	1		
157		720167	IN5221B	CR5	1	1		
158		100415	IN746A	CR8	1	1		
159		741001	SCR, 2N4990	CR9	1	1		
160								
161		720440	IN4148	CR11	1	1		
165		025756	IC	A1	1	1		

MODEL	JOB NO.	LOT QTY	LOT NO.	CODE IDENT 52542
PLANNER	PREP DATE	SYSTRON DONNER CORPORATION		
	CHK'D	SHIPPING ASS'Y VPH 5.2-50 MOVS 6489		
MAT. DUE	APP'D			
		DRAWING NO.		
3/U REQ.		REF	SIZE	PART NO.
3.U COMP		—	P	065114
	USED ON	SHEET 5 OF 7		

REVISIONS DESCRIPTION

ITEM NO.	SIZE	PART NUMBER	DESCRIPTION	REFERENCE NO.	ASSY QTY	ACT. CODE	ISS. QTY	SHT QTY
			CONTROL BD ASS'Y (CONT)		X	X		
67		106587	TRANSISTOR, 2N2219A	Q1	1	1		
69		640390	RES. 220Ω-2W-10%	R1	1	1		
70		600207	POT. 2K-½W-20%	R3	1	1		
71		620436	2.26K-½W-1%	R4	1	1		
72		620488	3.4K	R5	1	1		
73		620534	4.64K	R6	1	1		
74		620402	1.96K	R7	1	1		
75		106012	2.2Ω	R8, 14	2	1		
76		117188	POT. 100Ω-½W	R11, 16, 21, 4	1	1		
77			S/A R11	R24		R		
78		101474	330Ω-½W-5%	R12, 13	2	1		
79								
80		640434	400Ω-5W-5%	R15	1	1		
81		640182	7.5Ω-10W	R17, 18	2	1		
82								
83		640250	20Ω-5W-5%	R19	1	1		
84		640140	3.3Ω-2W-10%	R20	1	1		
85		101459	1.5K-½W-5%	R22	1	1		
86		101467	1K-½W-5%	R23, 29	2	1		
87		640380	150Ω-2W-10%	R25	1	1		
88		611100	2.2M-½W-5%	R26	1	1		
89		101511	4.7K-½W-5%	R27, 31	2	1		
90		101510	6.8K-½W-5%	R28	1	1		
91		101667	220Ω-½W-5%	R30	1	1		
92		101454	2.2K-½W-5%	R32	1	1		

MODEL	JOB NO.	LOT QTY	LOT NO.	CODE IDENT
				52542

PLANNER	PREP DATE	SYSTRON DONNER CORPORATION
	CHK'D	SHIPPING ASS'Y VPH 5.2-50 MOVS 6539
MAT. DUE	APP'D	
B/U REQ.		DRAWING NO.
B/U COMP		REF — SIZE P — PART NO. 065114 — REV
	USED ON	SHEET 5 OF 7

REVISIONS DESCRIPTION

KEY

ITEM NO.	SIZE	PART NUMBER	DESCRIPTION	REFERENCE NO.	ASSY QTY	ACT. CODE	ISS. QTY	SHT QTY
99		PD2734301	AC-DC HARNESS		1	2		
100		PD27343	HARNESS LIST			R		
101		VPH-1	" LAYOUT			R		
103		PD2709101	DC CABLE		1	2		
104		PD27091	" " LIST			R		
105		VPH-2	" " LAYOUT			R		
107		PD27350	LOOSE WIRES		1	2		
111	A		WIRING, T101 & L101	PD27349	1	R		
112	A		" REAR PANEL	PD27348	1	R		
113	A		" FRONT PANEL	PD25012	1	R		
114	A		" P.C. BOARD	PD25003	1	R		
115	A		" HEAT-SINK	PD25174	1	R		
116	B		" " "	PD25008	1	R		
117	B		" CHASSIS	PD25011	1	R		

MODEL	JOB NO.	LOT QTY	LOT NO.	CODE IDENT 52542
PLANNER	PREP DATE		SYSTRON DONNER CORPORATION	
	CHK'D		SHIPPING ASSY VPH 5.2-50 MOVS 6539	
MAT. DUE	APP'D			
B/U REQ.			DRAWING NO.	
			REF SIZE — P	PART NO. 065114 REV
B/U COMP			SHEET 7 OF 7	

KEY DESCRIPTION

B	REDRAWN FROM E SIZE.				
C	R103 & CR104 WAS P/N 720088			6-8	R13
D	CHANGED S101 TO A DPST, REMOVED CONNECTIONS FROM TB101 TERMINALS 4,5,6		TCO 116	7/80	RAB

NOTES

1. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE ½W ± 5%. RESISTANCE VALUES ARE EXPRESSED IN OHMS. CAPACITANCE VALUES ARE EXPRESSED IN MICROFARADS.
2. ALL MODELS ARE SHOWN WITH OVER VOLTAGE PROTECTION. TO DELETE, OMIT CR106, 219 THRU R23, C7 & C9, CR8 & CR9.
3. * DENOTES SELECT AT TEST.
4. LAST REFERENCE DESIGNATIONS USED ARE: R32 (ON CKT BOARD). (R1, R16 NOT USED). R117 (ON POWER CIRCUIT) C13 (ON CKT BOARD). (C11, C10 NOT USED). C108 (ON POWER CIRCUIT). CR13 (ON CKT. BOARD). CR108 (ON POWER CIRCUIT) (CR105 NOT USED). Q113 (ON POWER CIRCUIT). A1 (ON CKT. BOARD)
5.

MODEL	Q104 - Q113	M101
VPH5.2-30 (6489)	700101	50A
VPH5.2-50 (6539)	700088	20A
VPH5-60 (6539A)	700088	00A

PASS TRANSISTORS

INPUT 208 TO 235 VAC ±10% 50/60 Hz

T101 504291

TB101

F1 (SLO-BLO) 8A, 250V

S101

B101

C101 0.1, 250V

CR101 IN5401

C102 0.1, 250V

CR102 IN5401

C107 6000 40V

CR103 70H10A

CR104 70H10A

C103 1.0 250V

S102 880003 PROTECTIVE THERMAL SWITCH 115°C

Q101 705071

Q102 705071

Q103 700196

R101 0.2, 3W

R102 0.2, 3W

R103 1K

R114 100

Q104 THRU Q113

R104 0.1, 5W

R105 THRU R112

R113 0.1, 5W

R115 10, 2W

CR108 IN1200A

CIRCUIT BOARD

R117 0.0012 AMMETER SHUNT

TB102

R14 2.2

R16 100, 20% CW

R11 100, 20% CW CURRENT LIMIT ADJ.

R12 * 330

R30 220

Q1 2N2219A

CR5 IN5221B 2.4V

R13 330

R24 100 20% CW

M101

R15 400 3W

R1 220, 2W

CR3 IN4741A 11V

C8 .01 600V

C11 68-15V

R28 6.8K

A1 MA723C

C3 .01 600V

CR12 IN 4384

CR1 IN4004

CR2 IN4004

CR4 IN753A 6.2V

C1 100 50V

R31 4.7K

R26 * 2.2M

R3 2000, 20% CW

CR11 IN4148

C4 470pf

R8 2.2

R29 1K

R27 4.7K

CR13 IN4384

R18 75 5W

R17 7.5 10W

R19 20, 5W

R20 3.3 2W

R22 1.5K

CR8 IN746A 3.3V

CR9 2N4990

C7 .05 200V

R23 1K

C9 0.1 100V

CW R21 100 20%

CR7 IN4384

C6 35, 25V

C13 200 25V

R4 2.26K, 1%

R5 3.40K 1%

R32 2.2K

C12 35V 25V

R6 4.64K, 1%

7.15V

2.2V

R7 4.96K 1%

CR6 IN4384

C5 35, 25V

R25 150, 2W

CR106 C226F

CR107 IN1199A

C108 25000 25V

L101 504125

C104 1.0 250V

C105 25000 25V

C106 25000 25V

LED DS101

DC ON

R116 500 VOLTAGE ADJUST CW

TB103

+V +S R-P -S

R402 2.5K

R401 1K

8V

M102

-V

PROPRIETARY DATA

SYSTRON DONNER CORPORATION CONCORD, CALIFORNIA

CODE IDENT 52542

SCHEMATIC
VPH5.2-30 S6489
VPH5.2-50 S6539
VPH5-60 S6539A

D 124150 D